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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/633,886	08/04/2003	Charles H. Dennison	ITO.0544US (P15589)	5250

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EXAMINER

LOKE, STEVEN HO YIN

ART UNIT	PAPER NUMBER
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2811

DATE MAILED: 08/22/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/633,886

Applicant(s)

DENNISON, CHARLES H.

Examiner

Steven Loke

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 June 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-21,23,24 and 26-29 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-13,15-21,23,24 and 26-29 is/are rejected.
- 7) ☒ Claim(s) 14 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 06 June 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Art Unit: 2811

1. Claims 9, 10, 15-20 and 29 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 9, lines 1-2, the phrase "an upper electrode over.....said threshold switch" is vague and indefinite. Fig. 10 discloses the upper electrode [34] is part of the threshold switch (page 10, lines 12-14). Therefore, it is believed that the upper electrode [34] is over said phase change storage element only.

Claim 15, lines 1-2, the phrase "forming a vertical groove in said memory array and in a periphery" is unclear whether there is a first groove formed through the insulator in the memory array and a second groove formed through the insulator in said periphery of said phase change memory.

Fig. 12 discloses forming a vertical groove [48] formed through the insulator in the periphery of the phase change memory. Fig. 13 discloses a sacrificial light absorbing material filling the groove [48]. Fig. 14 discloses forming a vertical groove [53] through the insulator [44] in the phase change memory and forming a vertical groove [55] through the insulator [44] in the periphery of the phase change memory. It also discloses the groove [55] is not filled with sacrificial light absorbing material [47]. The groove [53] and the groove [55] have the same depth. However, it is unclear why claim 16 discloses filling said groove in said periphery with a sacrificial light absorbing material after a vertical groove formed in both the memory array and the periphery of the phase change memory. It is also unclear why claim 17 further discloses etching said groove in said periphery into said sacrificial light absorbing material. It is unclear

Art Unit: 2811

why claim 19 discloses forming said groove in said periphery deeper than said groove in the memory array. It is believed the claims should rewrite as follow: the method including forming a vertical groove in the periphery of the phase change memory (fig. 12); then filling the groove in the periphery of the phase change memory with a sacrificial light absorbing material (fig. 13); and etching the groove in the periphery of the phase change memory into the sacrificial light absorbing material and etching a second groove in the memory array (fig. 14).

Claim 18, line 2, the phrase "said groove" is unclear whether it is being referred to said groove in the periphery of said phase change memory.

Claim 20, lines 1-2, the phrase "said groove in said periphery" is unclear whether it is being referred to "a third groove". Fig. 14 shows the groove [55] is formed after the upper portion of the sacrificial light absorbing material is removed from the first groove.

Claim 29, lines 2-3, the phrase "an insulator" is unclear whether it is being referred to the insulator in line 2 of claim 29.

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 21 and 27 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Technische Hochschule Karl-Marx-Stadt (DD 251 225 A1 in the IDS filed on 1/21/05).

Art Unit: 2811

In regards to claim 21, Technische Hochschule Karl-Marx-Stadt shows all the elements of claimed invention in figs. 1 and 2. It is an apparatus, comprising: a phase change memory [9, 10] including a phase change storage element [9, (5, 7, 8)] and a phase change threshold switch [10, (2, 4, 5)]; a conductive line [2] coupled to said phase change storage element [9] and said phase change threshold switch [10]; and a via (an area where layer [4] extends through the silicon dioxide layer [3]) to said conductive line [2].

In regards to claim 27, Technische Hochschule Karl-Marx-Stadt further discloses a barrier layer [6] between the threshold switch [10, (a portion of layer [5] under layer [6], 2, 4)] and the storage element [9, (a portion of layer [5] not under layer [6], 7, 8)].

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1, 3-7, 11-13, 21, 23, 24, 26, 27 and 29 are rejected under 35

U.S.C. 102(e) as being clearly anticipated by Parkinson et al.

In regards to claim 1, Parkinson et al. show all the elements of the claimed invention in figs. 4-12. It is a method, comprising: forming a phase change memory [100] (the device in the right side of fig. 12) including a phase change storage element [130] and a phase change threshold switch [120]; and forming a damascene via ([340] formed under

Art Unit: 2811

the memory [100] in the middle of fig. 12) (the via [340] is considered as a damascene via because it is planarized by the chemical mechanical polishing techniques) (col. 13, lines 36-45) to a conductive line [270] in the periphery of said phase change memory.

In regards to claim 3, Parkinson et al. show forming said switch [120] over said element [130].

In regards to claim 4, Parkinson et al. show forming, in said memory, a pore (the area occupied by [340]) over a substrate [240], said pore having a dimension smaller than the feature size possible with lithographic techniques (col. 13, lines 11-15).

In regards to claim 5, Parkinson et al. show forming said pore by forming an aperture [425] through an insulator [410] and forming a sidewall spacer [420] in said aperture.

In regards to claim 6, Parkinson et al. show forming a lower electrode [340] of said phase change storage element in said pore.

In regards to claim 7, Parkinson et al. show forming a barrier layer [370] between said threshold switch [120] and said storage element [130].

In regards to claim 11, Parkinson et al. show forming said phase change memory includes forming a memory array (the three memory cells in fig. 12) including a plurality of memory cells as a plurality of integrated islands [500] spaced from one another.

In regards to claim 12, Parkinson et al. show filling the regions surrounding said islands [500] with an insulator [510, 520].

In regards to claim 13, Parkinson et al. show forming said insulator [510, 520] to a height over the upper extent of said islands (fig. 11).

In regards to claim 21, Parkinson et al. show all the elements of the claimed invention in figs. 4-12. It is an apparatus, comprising: a phase change memory [100] (the device in the right side of fig. 12) including a phase change storage element [130] and a phase change threshold switch [120]; a conductive line [270] coupled to said phase change storage element [130] and said phase change threshold switch [120]; and a via ([340] formed under the memory [100] in the middle of fig. 12) to said conductive line.

In regards to claim 23, Parkinson et al. show said switch [120] is formed over said element [130].

In regards to claim 24, Parkinson et al. show said memory includes a substrate [240], a pore (the area occupied by [340]) over a substrate [240], said pore having a dimension smaller than the feature size possible with lithographic techniques (col. 13, lines 11-15).

In regards to claim 26, Parkinson et al. show an electrode [340] for said phase change storage element [130] in said pore.

In regards to claim 27, Parkinson et al. show a barrier layer [370] between said threshold switch [120] and said storage element [130].

In regards to claim 29, Parkinson et al. show said memory includes an insulator [280] and said via ([340] formed under the memory [100] in the middle of fig. 12) includes a metal (TaN) line extending through said insulator [280].

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

Art Unit: 2811

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 8 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Parkinson et al.

In regards to claim 8, Parkinson et al. show forming an upper electrode [380] over said phase change storage element [130].

Parkinson et al. differ from the claimed invention by not showing said upper electrode having a vertical extent at least twice its horizontal extent.

It would have been obvious for the upper electrode having a vertical extent at least twice its horizontal extent because it depends on the density of the memory cells in the memory.

In regards to claim 28, Parkinson et al. show an upper electrode [380] over said phase change storage element [130].

Parkinson et al. differ from the claimed invention by not showing said upper electrode having a vertical extent at least twice its horizontal extent.

It would have been obvious for the upper electrode having a vertical extent at least twice its horizontal extent because it depends on the density of the memory cells in the memory.

8. Applicant's arguments filed 6/6/05 have been fully considered but they are not persuasive.

It is urged, in page 7 of the remarks, that claim 17 is clear by comparing Figures 13 and 14 with the groove 55 resulting in Figure 14. However, the process steps in claims

Art Unit: 2811

15-17 are different than the process steps in figs. 12, 13 and 14. It is believed that claims 15-17 should be amended to overcome the confusion.

It is urged, in page 7 of the remarks, that the groove in the periphery could be claimed to be deeper than the groove in the memory array. The groove 55 and 53 may be compared to see that the drawings do show this feature. However, fig. 14 shows grooves 55 (the lateral extended bottom surface) and 53 (the bottom surface) have the same depth.

It is urged, in page 8 of the remarks, that the prior art rejection is ineffective because there is no translation of the prior art. However, it is believed that the prior art discloses all the claimed limitation as claimed in claims 21 and 27. The examiner translated all the definition of the reference numerals from a dictionary.

9. Claim 14 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

10. The following is a statement of reasons for the indication of allowable subject matter: The major difference in the claims not found in the prior art of record is forming grooves through said insulator down to and past the upper extent of said islands.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Steven Loke whose telephone number is (571) 272-1657. The examiner can normally be reached on 8:20 am to 5:50 pm.

Art Unit: 2811

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

sl
August 17, 2005

Steven Loka
Primary Examiner
